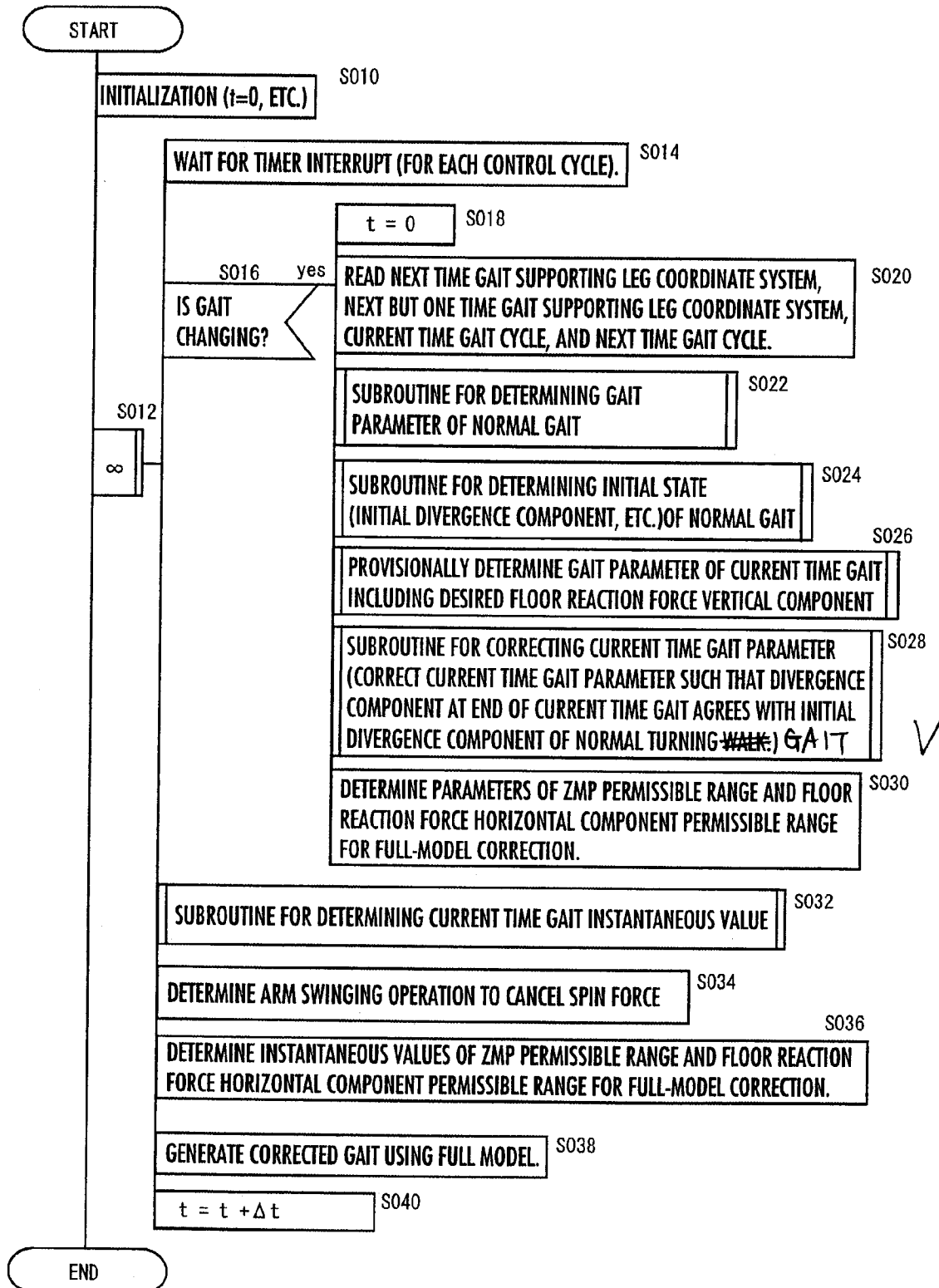


ANNOTATED

10 / 20

FIG.10



ANNOTATED

12 / 20

S024

ENTRY

FIG.12

DETERMINE INITIAL STATES (STATES AT INITIAL TIME t_s) OF FOOT POSITION/POSTURE, BODY POSTURE ANGLE θ_{bs} , AND ARM POSTURES ON THE BASIS OF NORMAL TURNING GAIT PARAMETER.

S200

PROVISIONALLY DETERMINE INITIAL (AT t_s) BODY HORIZONTAL POSITION, VELOCITY, ANGULAR VELOCITY, AND BODY INCLINATION RESTORING MOMENT ZMP-CONVERTED VALUE PEAK VALUE CANDIDATES ($X_s, V_{xs}, \omega_{bs}, ZMP_{prepeak}$).
peak

S202

DETERMINE INITIAL BODY VERTICAL POSITION/VELOCITY (Z_s, V_{zs}).

S206

USING DYNAMIC MODEL, GENERATE GAIT FOR ONE STEP ON THE BASIS OF NORMAL TURNING GAIT PARAMETER INCLUDING $ZMP_{prepeak}$, TAKING $\theta_{bs}, (X_s, V_{xs}, \omega_{bs}), (Z_s, V_{zs})$ AS INITIAL STATES OF BODY.
peak

S208

HORIZONTAL

S210

CONVERT TERMINAL BODY POSITION, VELOCITY, POSTURE ANGLE, AND ANGULAR VELOCITY OF GENERATED GAIT INTO VALUES OBSERVED FROM SUPPORTING LEG COORDINATE SYSTEM OF NEXT STEP, AND DENOTE THE VALUES BY ($X_e, V_{xe}, \theta_{be}, \omega_{be}$).
peak

S204

BOUNDARY CONDITION ERRORS ($err_x, err_v, err_\theta, err_\omega$)
 $= (X_s, V_{xs}, \theta_{bs}, \omega_{bs}) - (X_e, V_{xe}, \theta_{be}, \omega_{be})$

S212

∞

S214 yes

LEAVE REPETITION LOOP.

ARE ALL $err_x, err_v, err_\theta, err_\omega$ WITHIN PERMISSIBLE RANGES?

peak → peak

DETERMINE A PLURALITY OF CANDIDATES ($X_s + \Delta X_s, V_{xs}, \omega_{bs}, ZMP_{prepeak}$), ($X_s, V_{xs} + \Delta V_{xs}, \omega_{bs}, ZMP_{prepeak}$), ($X_s, V_{xs}, \omega_{bs} + \Delta \omega_{bs}, ZMP_{prepeak}$), ($X_s, V_{xs}, \omega_{bs}, ZMP_{prepeak} + \Delta ZMP_{prepeak}$) IN THE VICINITY OF ($X_s, V_{xs}, \omega_{bs}, ZMP_{prepeak}$), AND BASED ON THEM, DETERMINE BOUNDARY CONDITION ERROR CORRESPONDING TO EACH OF THEM AS DESCRIBED ABOVE.

S216

DETERMINE NEW CANDIDATES ($X_s, V_{xs}, \omega_{bs}, ZMP_{prepeak}$) ON THE BASIS OF BOUNDARY CONDITION ERRORS CORRESPONDING TO ($X_s, V_{xs}, \omega_{bs}, ZMP_{prepeak}$) AND EACH OF CANDIDATES IN THE VICINITY THEREOF.
peak

S218

HORIZONTAL

DETERMINE INITIAL BODY POSITION, VELOCITY, POSTURE ANGLE, AND ANGULAR VELOCITY ($X_0, V_{x0}, \theta_{b0}, \omega_{b0}$), INITIAL BODY VERTICAL POSITION AND VELOCITY (Z_0, V_{z0}), AND INITIAL BODY POSTURE ANGLE AND ANGULAR VELOCITY AT ORIGINAL INITIAL TIME 0.

S220

DETERMINE NORMAL TURNING INITIAL DIVERGENCE COMPONENT $q[0]$ ACCORDING TO THE FOLLOWING EXPRESSION.

S222

$$q[0] = X_0 + V_{x0} / \omega_0$$

DETERMINE q'' , WHICH IS THE VALUE OF NORMAL TURNING INITIAL DIVERGENCE COMPONENT $q[0]$ OBSERVED FROM SUPPORTING LEG COORDINATE SYSTEM OF CURRENT TIME GAIT, AND (Z_0'', V_{z0}''), WHICH ARE VALUES OF INITIAL BODY VERTICAL POSITION AND VELOCITY OBSERVED FROM SUPPORTING LEG COORDINATE SYSTEM OF CURRENT TIME GAIT.

S224

RETURN

ANNOTATED

17 / 20

FIG.17

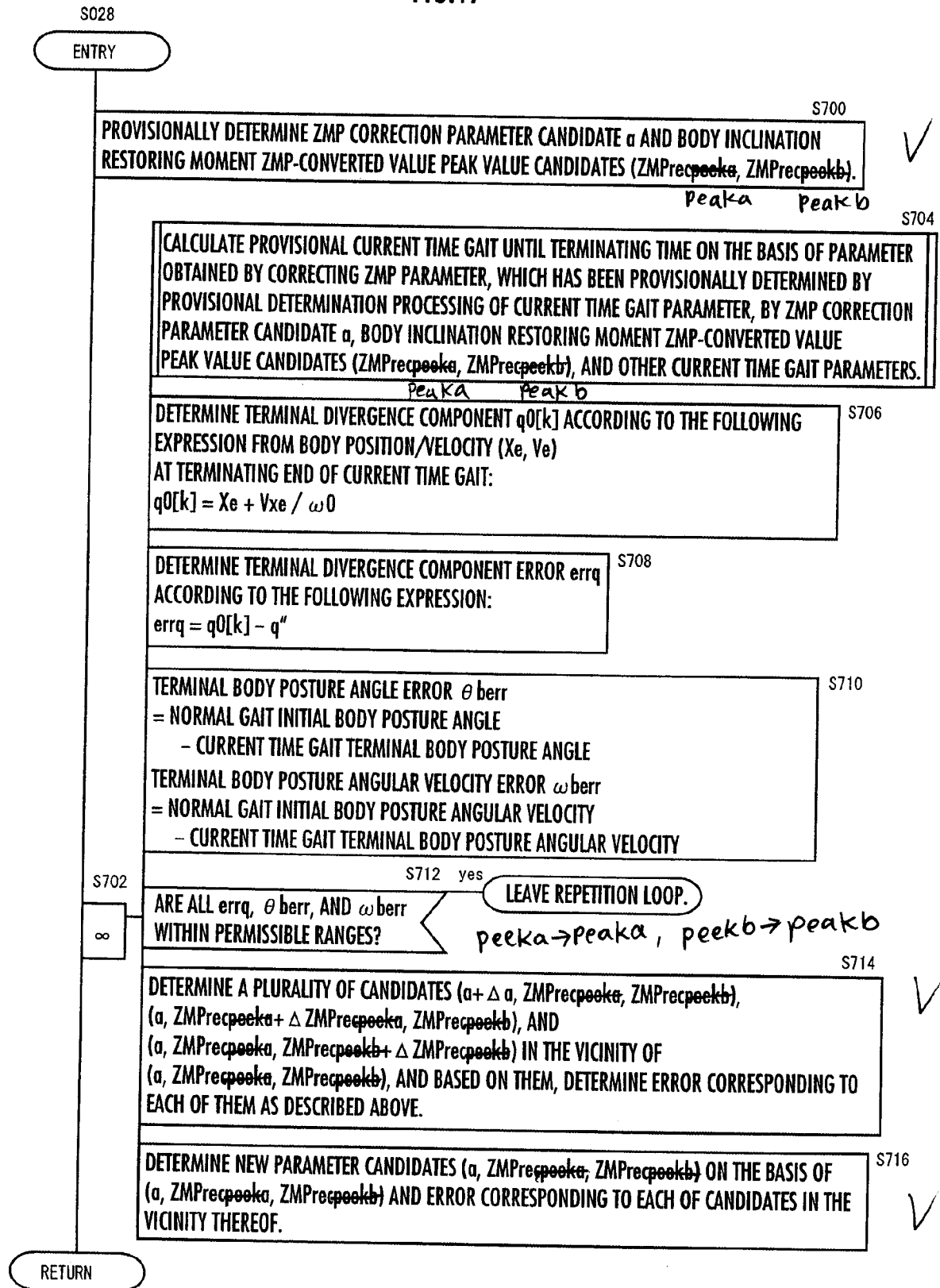


FIG.19

BODY INCLINATION RESTORING MOMENT ZMP-CONVERTED VALUE OF NORMAL GAIT (ZMP_{rec})

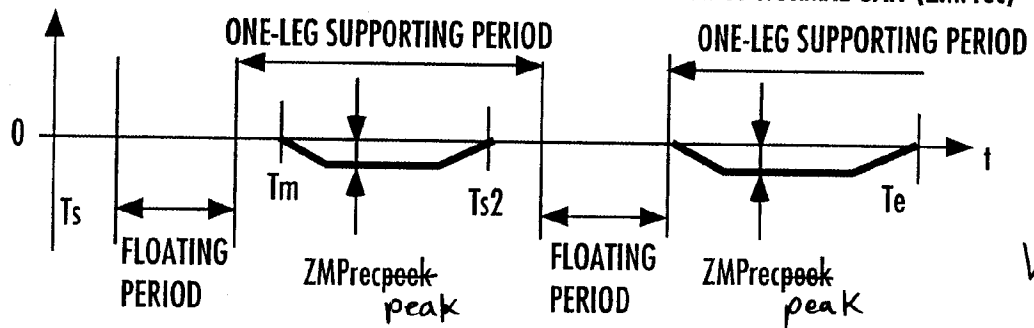


FIG.20

BODY INCLINATION RESTORING MOMENT
ZMP-CONVERTED VALUE OF CURRENT TIME GAIT (ZMP_{rec})

